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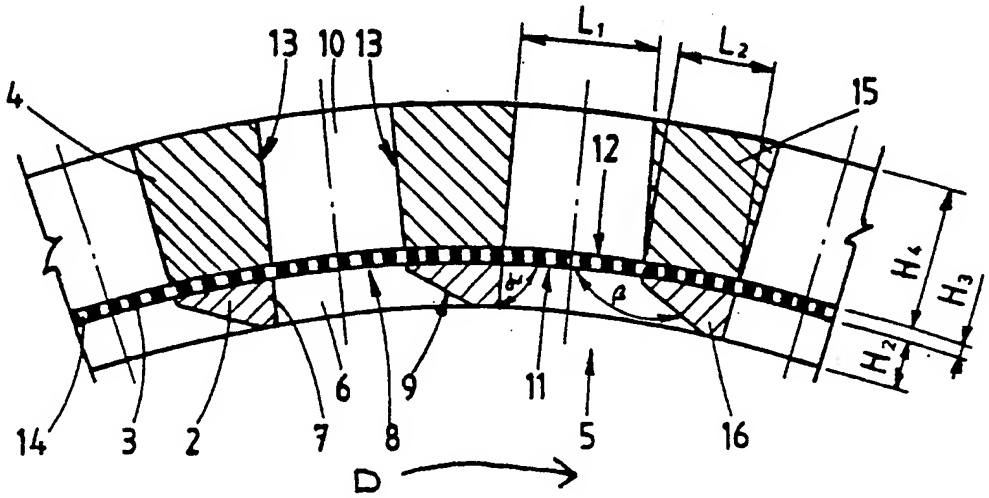
(54) Title: SCREEN CYLINDER




(57) Abstract

A screen cylinder (1) having holes (14) or slots which are located in the bottom of grooves (5) which are disposed in the inlet side surface of the cylinder and which generate micro turbulence. The screen cylinder (1) is composed of three parts (2, 3, 4) arranged one within the other and connected to each other by a shrink fit. A perforated plate part (3) located in the middle having small holes (14) or slots is sandwiched between the inner part (2) and the outer part (4). The outer part and the inner part have large apertures (6, 10) each of which extends over several small holes (14) in circumferential direction of the perforated plate part (3).

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SCREEN CYLINDER

Field of invention:

The present invention relates to a cylindrical screen member or so called screen cylinder as referred to herein in which holes or apertures are located at the bottom of recesses on the inlet side for the pulp to be screened. The screen cylinder is primarily intended to be used in apparatus used for screening of pulps in the pulp and paper industry but it can also be used, for example, in the food industry for treatment of tomatoes and citrus fruit.

Essential in the screening is that the accept is clean and that no excessive amounts of prime fibre are lost with the reject.

To achieve ideal screening, the pulp should remain as a homogenous suspension in the screening zone. In practice, however, flockulation and felting occur. Fibre flocks are easily rejected and prime fibre is lost with them.

To be able to efficiently separate impurities from the pulp the holes in the screen cylinder should be as small as possible.

For a high capacity of the screening device the open area of the screen cylinder should be as large as possible. As the hole or slot size diminishes the capacity of the screen cylinder decreases rapidly, and, in particular in case of long fibre pulps, it is impossible to increase the open area by reducing the hole spacing. If this is done, two adjacent holes tend to accept the same fibre whereby the ends of the fibre are stuck in the holes. This so-called riding or blinding phenomenon rapidly pluggs the screen cylinder. Thus the capacity of slot screen plates in particular is often

limited by this blinding phenomenon.

Prior art:

Finnish patent specification no. 67588 discloses a screen drum in which the holes are located in the bottom of grooves which are disposed in a direction substantially deviating from the flow direction of the pulp to be screened. The grooves in the screen plate surface generate micro turbulence which disrupt fibre flocks. Because of the grooves the distance between the adjacent slots or holes can be decreased and the open area of the screen drum can be larger than in a screen with smooth surface, without the risk of riding or blinding phenomenon.

A screen drum is, however, during its manufacture and in operation subjected to stresses which impose certain requirements on its strength which in turn limit the open area. Also generation of efficient turbulence imposes certain requirements on the dimensions of the grooves (height, width and angle), which determines the minimum distance between the holes.

German patent specification number DE 33 36 874 A 1 discloses a screen cylinder with cylindrical recesses in the pulp inlet side and with each of the recesses extending over several screen holes whereby the screen drum wall on the pulp inlet side forms a network structure between the recesses. The disclosed construction is good as far as the strength is concerned but as regards screening, it not as good as the screen drum disclosed in the Finnish patent specification no. 67588.

Disclosure of invention:

It is an object of the present invention to provide a screen cylinder which has good strenght as well screening properties.

The screen cylinder according to the present invention is characterized in that it is composed of three, substantially cylindrical parts arranged one within the other and comprising a part on the pulp inlet side having passages or holes and forming recesses, a part having screening perforations, and a part on the pulp discharge side forming a supporting structure and having passages or holes which correspond to the passages or holes in the first-mentioned part.

The invention allows the use of thin perforated plates, wires etc. in the screen cylinder. Further, the profile construction on the pulp inlet side can be manufactured of a wear-resistant material. The invention also allows free choice of the form of the openings on the pulp inlet side as the part of the cylinder on the pulp inlet side is machined separately and thus both its sides are accessible.

Brief description of drawings:

Fig. 1 is a schematic side elevation, partly in section, of a side view of a screen cylinder according to the invention;

Fig. 2 is an enlarged fragmentary detail comprising axial section of portion A of Fig. 1;

Fig. 3 is an enlarged section on the line B-B of Fig. 1;

Fig. 4 is an enlarged fragmentary perspective view in the direction of arrow C in Fig. 1; and

Fig 5 is the same view as Fig. 3 but of an alternative embodiment of the invention.

Detailed description of the drawings:

A screen cylinder 1 is illustrated in the drawings which is

intended to be used in a screening appatarus in which pulp to be screened is supplied by known means to a space inside the cylinder and, by means of a rotor or vanes (not illustrated) is there caused to execute a rotary motion having a large component tangential to the inside surface of the cylinder; and in which screening apparatus the accept pulp flows from the inside through the screen holes to the outside.

The screen cylinder 1 of Figs. 2 to 4 is composed of three parts, an inner part 2, a thin perforated plate 3 and an puter part 44 disposed one inside the other and which have been shrunk to each other in such a way that the thin perforated plate part 3 is pressed between the inner part 2 and the outer part 4. On the pulp inlet side of the cylinder, slots 6 existing in the inner part has form grooves 5 parallel with the longitudinal axis of the screen cylinder 1. One side surface 7 of each of the grooves 5 is perpendicular to the perforated plate surface 8 (angle $\alpha = 90^{\circ}$) and the other side surface 9 of each of the grooves is inclined in relation to the perforated plate surface (for example angle $\beta = 120^{\circ}$). The grooves 5 in the screen cylinder surface generate micro turbulence which disrupts fibre flocks and prevents the fibres from felting. Depending on the pulp grade and the required screened product the side surface 7 of each slot 6, which is perpendicular to the perforated plate, can be located upstream in respect of the pulp flow which flow direction is indicated by arrow 3 in Fig. 3, or surface 7 of each slot can be located downstream relative to the direction of pulp flow .

The outer part 4 of cylinder 1 has slots 10 with openings 12 directed towards the perforated plate 3. The openings 12 are of the same size and are located so as to correspond with the openings 11 of the slots 6 of the inner part directed towards the perforated plate 3. The side surfaces 13 of each of the slots 10 are substantially perpendicular to the perforated

plate. Each slot 10, or hole if provided as an alternative of the inner and the outer part extends over several holes in the perforated plate 2 in a circumferential direction.

The part 3 is manufactured from a perforated plate having a plurality of small holes. The diameter of the holes is preferably longer than their length, viz. longer than the thickness of the perforated plate 3.

In the alternative embodiment illustrated in Fig. 5, one the side surface 27 of each of slots 26 in inner part 22 subtends an acute angle with the surface of the perforated plate and other side surface 29 of each of slots 26 subtends an obtuse angle with the perforated plate surface. A rotor (not shown) preferably rotates in the direction indicated by arrow E whereby each side surface 27, which forms an acute angle with the perforated plate surface, is upstream in respect of the flow direction. As a result of this arrangement, the intensity of the turbulence is high.

The following dimensions have proved to be appropriate:

thickness $H_2$ of the screen cylinder inner part 2 to 4 mm,
thickness $H_3$ of the center part 0.2 to 2 mm,
thickness $H_3$ of the outer part 4 to 10 mm,
angle $\alpha$ 60 to 90° and angle $\beta$ 120 to 150°,
diameter of the holes of the perforated plate 0.5 to 1.2 mm,
width of the slots of the slotted plates 0.1 to 1 mm,
width $L_1$ of the slots 11 and 12 of the inner and outer slotted plates, directed towards the perforated plate 4 to 8 mm,
width $L_2$ of the inner and outer plate portions 15 and 16 pressing the perforated plate 3 to 5 mm.

The scope of protection sought for the invention is not intended to be limited to the embodiments presented here but

several modifications and different applications of it are possible within the scope of protection defined by the appended claims. It will be readily apparent that the invention is also applicable in screen cylinders in which the flow direction is from a space outside the cylinder into the cylider. It is also envisaged the screen cylinder may be provided in screening apparatus where the cylinder rotates. The center part of the screen cylinder can be provided with grooves or other recesses or other apertures apart from cylindrical or circular holes or slotted apertures.

We claim:

1. A screen cylinder (1) having holes (14) or slots which are located in the bottoms of recesses (5) disposed in the inlet side surface of the cylinder, characterized in that the cylinder is composed of three substantially cylindrical parts arranged one within the other, viz. a part (2) on the pulp inlet side having apertures (6) which with a central part (3) forms said recesses (5) and with said central part (3) having screening perforations (14), and a part (4) on the pulp outlet side which forms a supporting structure and has apertures (10) located correspondingly to the first mentioned apertures (6) in the first mentioned part (2).

2. A screen cylinder as claimed in claim 1 characterized in that the tree parts (2, 3, 4) are interconnected by means of shrink fitting.

3. A screen cylinder as claimed in claim 1 or 2 characterized in that the thickness of the wall of the center part (3) is 0.2 to 2 mm.

4. A screen cylinder as claimed in claim 3, characterized in that there are cylindrical holes (14) in the center part (3), the maximum diameter of said holes being equal to the thickness ($H_3$) of the wall of the center part (3).

5. A screen cylinder as cliamed in any of cliams 1 to 4, characterized in that the inner part (2) is made of a wear-resistant material.

6. A screen cylinder as claimed in any of claims 1 to 5, characterized in that the apertures (6) of the inner part (2) form ribs (5) which are substantially parallel with the longitudinal central axis of the screen cylinder.

7. A screen cylinder as claimed in claim 6, characterized in that both side surfaces (27, 29) of the grooves or slots (26) are inclined in relation to the screen surface (28).

8. A screen cylinder as claimed in claim 6, characterized in that one of the side surfaces (6) of the grooves is substantially perpendicular relative to the screen surface (8) and the other side surface (9) is inclined in relation to the screen surface (8).

9. A screen cylinder as claimed in claim 6, characterized in that the downstream side surfaces (27) of the grooves or slots (26) subtend an acute angle ($\alpha$) with the screen surface (8) and the upstream side surface (29) subtends an obtuse angle ($\beta$) with the screen surface.

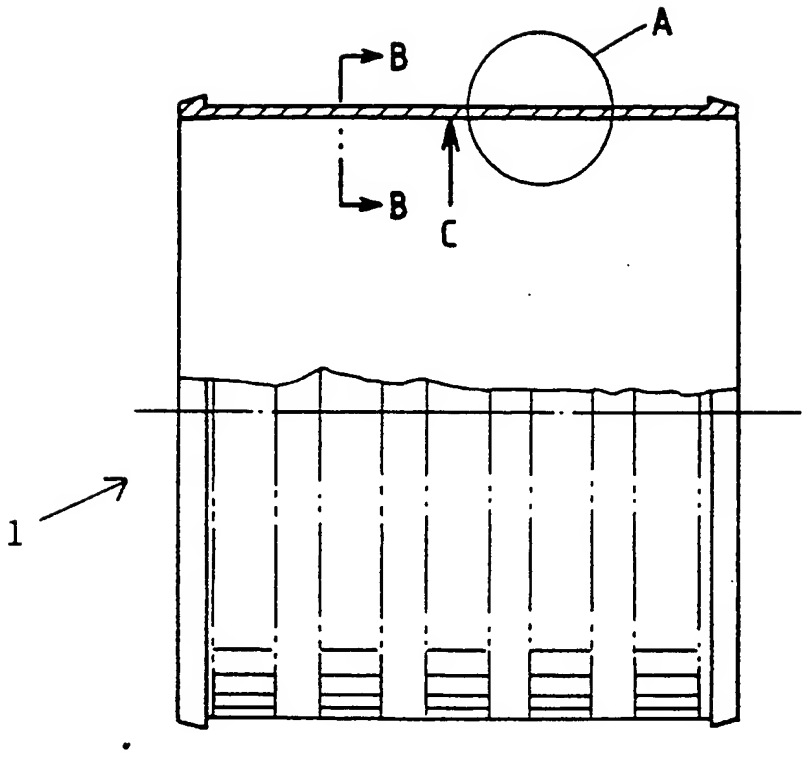


FIG.1

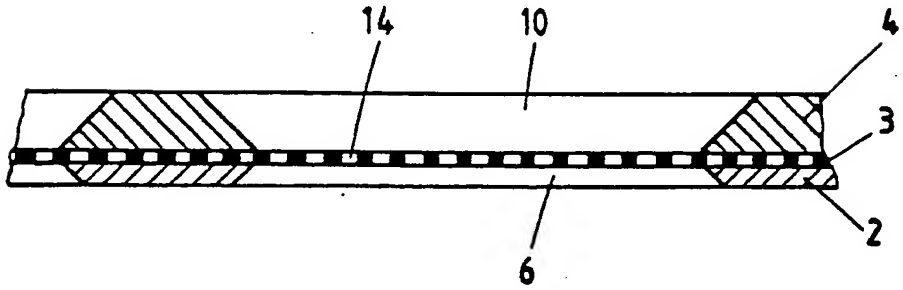


FIG. 2

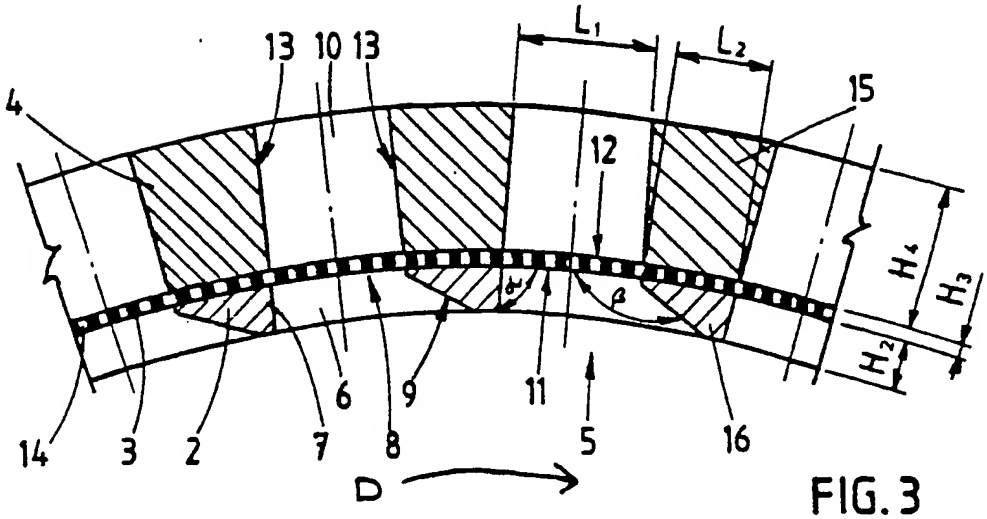


FIG. 3

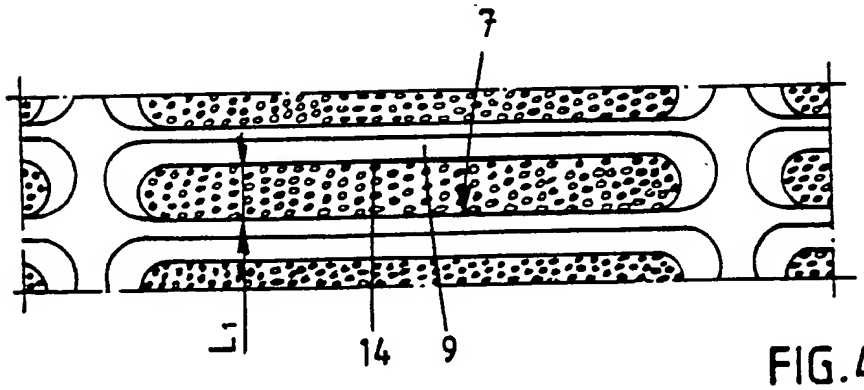


FIG. 4

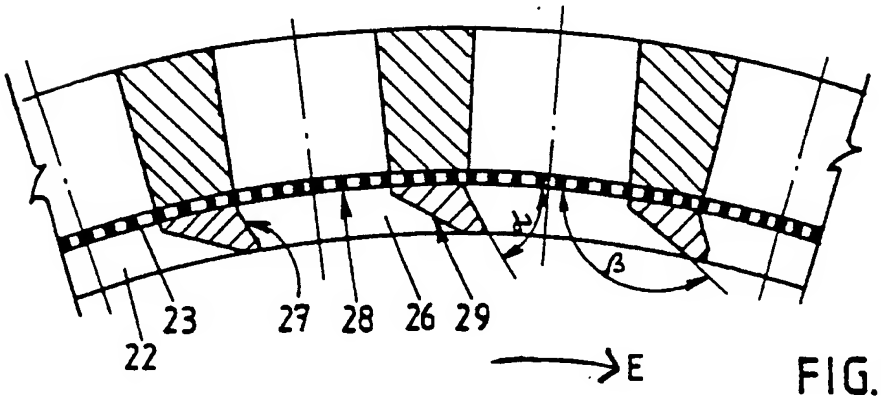


FIG. 5

# INTERNATIONAL SEARCH REPORT

International Application No PCT/FI87/00012

## I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

D 21 D 5/16 4

## II. FIELDS SEARCHED

Minimum Documentation Searched [7]

| Classification System | Classification Symbols |
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| IPC | D 21 D 5/16 |
| US Cl | 209:397; 210:497, 497.1, 498 |

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

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## III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

| Category * | Citation of Document, [11] with indication, where appropriate, of the relevant passages [12] | Relevant to Claim No. [13] |
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| A | DE, A, 252 334 (LEOBERSDORFER MASCHINEN-FABRIKS-AKT. GES.) 18 October 1912 | 1 |
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